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An apparatus for detecting animals

THE BACKGROUND OF THE INVENTION AND PRIOR ART

The present invention refers to an apparatus for detecting an animal having a body part and a head part, comprising: an animal passage extending in a transport direction, said passage being defined by a first enclosure member and a second enclosure member, which members are arranged on a respective side of the passage and extend substantially in parallel to said transport direction, and a sensor device, which is arranged to sense the animal in the passage.

The present invention refers to the managing of animals in general. The invention is thus applicable to animals such as cows, sheep, goats, horses, buffaloes etc. In the following, it will be referred to the managing of cows although the application is not limited to any specific kind of animals. All these animals to which the present invention is applicable have a head part formed by the neck and the head of the animal, and a body part extending rearwardly from the neck and formed by the body and including the rear legs and the forward legs of the animal.

When managing cows it is often important to be able to detect the position of an individual cow with a high precision. When a number of cows are moving forwardly in a passage, a so-called lane, it is necessary to be able to interrupt the movement of the cows by means of an interruption gate, a so-called saloon gate, or to redirect

one or several cows from the passage by means of a direction gate. If these gates are not working in a manner synchronised with the position of the cows, the function is not reliable and the efficiency of the managing of the cows is negatively influenced. The cows are sometimes walking so close to each other in a train of cows in such a passage that there is no completely free space between the cows. In such a situation, it is difficult to detect the individual cows by means of conventional detector and sensing means including, for instance, a photo cell.

It is also known to provide the cows with a transponder for the identification of the cows. By means of such a transponder, it is possible to detect the position of the cow for the control of the interruption gate to be closed behind the cow. However, the precision in such a detection by means of a transponder is not sufficient, making it difficult to close the interruption gate between two successive cows, and also creating a risk of hurting or injuring the cows. Moreover, a fact that is not taken into account in the prior art solutions is that the cows may have various lengths, which also means that the interruption gate will not always close in an optimum manner behind the cow.

Various apparatuses including means for detecting and sensing animals are described in the patent literature.

US-A-5,653,192 discloses an apparatus for sorting animals. The apparatus comprises a passage defined by longitudinal rails. An identifying sensor is provided for identifying the animals walking along the passage by sensing a transponder carried by the animals. The identifying sensor includes two antennas arranged on a respective side of the passage.

US-A-4,288,856 discloses a system for managing a live-stock having means for separating poorly performing animals. The

system includes a passage with gates and photo detectors. The photo detector may include a photo cell on one side of the passage and a light source on the other side of the passage, wherein the light beam is broken by the animal passing the detector.

US-A-4,274,083 discloses an apparatus for identifying moving objects, for instance an animal carrying a transponder. The cow carrying the transponder may be identified when passing a loop antenna.

SUMMARY OF THE INVENTION

The object of the present invention is to provide an apparatus for detecting an animal, and more specifically for detecting an animal with a high precision at a determined position.

This object is achieved by the apparatus initially defined, which is characterised in that the sensor device is arranged to sense a parameter related to a cross-section size of the animal at a determined position in the passage, and to produce a signal when the parameter fulfils a certain condition. By such an apparatus it is possible to detect in a reliable manner the exact position of the front end of the animal, or more precisely the beginning of the body part, and the rear end of the animal, or more precisely the rear end of the body part. A cross-section size, such as the width of the animal, normally varies along the length of the animal in such a way that the largest cross-section size of the head part of the animal is smaller than the smallest cross-section size of the body part of the animal. By using a sensor device detecting such a cross-section size, it is thus possible to identify the beginning and the end of the body part of the animal. Even if the animals are walking very close to each other so that the head of an animal is

lying on the body part of the forward animal, it is possible to detect the short gap or short distance between the end of the body part of the forward animal and the beginning of the body part of the following animal, since there is always a reduction in the cross-section size between the animals.

According to an embodiment of the present invention, the sensor device is arranged to produce said signal when the value of said parameter indicates that the cross-section size of the animal is less than a predetermined value at the determined position. Consequently, the sensor device may be arranged to detect when the cross-section size of the animal is less than the cross-section size of the body part of the animal. More precisely, the parameter may be related to the width of the animal seen in a determined direction, wherein the sensor device is arranged to produce said signal when said parameter indicates that the width of the animal is less than a predetermined value at the determined position. Preferably, the determined direction is a substantially vertical direction. The difference in the horizontal width between the body part an the head part of the animal is substantially constant and particularly easy to identify in a vertical direction. Moreover, the determined direction may advantageously be a substantially vertically downward direction. It is advantageous to arrange the sensor device above the animals in such a way that they are directed downwards since the environment is better and less subjected to dirt above the animals.

According to a further embodiment of the present invention, the sensor device comprises at least a first sensor and a second sensor, wherein the first sensor is arranged to sense the presence of the animal at a first point of the passage and wherein the second sensor is arranged to sense the presence of the animal at a second point of the passage. Advantageously, the first point and the second point are

both located at the determined position with regard to the transport direction, but spaced apart from each other with a distance, wherein said distance is larger than the width of the head part but smaller than the width of the body part of an animal of a normal size to be guided through the animal passage.

According to a further embodiment of the present invention, the first point is located in the proximity of the first enclosure member whereas the second point is located in the proximity of the second enclosure member. The first and second points are thus located inside the respective enclosure member within the passage. Furthermore, the first sensor and the second sensor are both provided above the passage to sense the animal passing below the respective first and second sensors.

According to a further embodiment of the present invention, the apparatus comprises a control member connected to the sensor device. Preferably, the control member may be arranged to count the animals passing the animal passage in response to the sensing of the sensor device. The apparatus according to the invention may thus be used for counting the animals passing through the passage.

According to a further embodiment of the present invention, the apparatus comprises a gate device arranged in the passage to take one of an open position and a closed position. The control member may then be arranged to control the position of the gate device in response to the sensing of the sensor device. The gate device may include a gate, which is provided in the proximity of the sensor device and arranged to close the passage, and thus to stop the following animals from moving further forward in the passage and to permit such further forward movement in the transport direction when so desired. Moreover, the gate device may

include a gate, which is provided in the proximity of the sensor device and arranged to close the passage and open an exit passage leading away from the passage, and thus to direct a specific animal in a desired direction away from the passage or along the passage.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described more closely by means of various embodiments thereof and with reference to the drawings attached hereto.

Fig 1 shows schematically a view from above of an apparatus according to a first embodiment cf the present invention.

Fig 2 shows schematically a view from above of an apparatus according to a second embodiment of the present invention.

DETAILED DESCRIPTION OF VARIOUS EMBODIMENTS OF THE INVENTION

Figs. 1 and 2 disclose a respective embodiment of an apparatus for detecting an animal. The animal is in the embodiments disclosed a cow 1. The cow 1 has a body part 2 and a head part 3. The head part 3 includes the head and the neck of the cow 1. The body part 2 extends rearwardly from the neck and includes the body with the forward legs and the rearward legs of the cow 1.

The apparatus comprises an animal passage 4 extending in a transport direction t. The animal passage 4 is in the embodiments disclosed an elongated space defined by a first enclosure member 5 and a second enclosure member 6. The enclosure members 5 and 6 may comprise usual metallic rail constructions dimensioned to withstand forces from

the cows 1 and prevent them from deviating from the animal passage 4. The first enclosure member 5 and the second enclosure member 6 both extend in the longitudinal transport direction t on a respective side of the animal passage 4.

The apparatus also comprises a sensor device 7, 8, which is arranged to sense the cows 1 moving forwardly in the transport direction in the animal passage 4. More specifically, the sensor device 7, 8 is arranged to sense the cows 1 at a determined position in the passage 4. The determined position is indicated by the transverse line p extending substantially perpendicular to the transport direction t. Consequently, the determined position means that the cow 1 has reached a certain position with regard to the longitudinal direction t, whereas the transverse position of the cows 1 in the animal passage 4 is substantially defined by the enclosure members 5 and 6.

The sensor device 7, 8 is arranged to sense a parameter related to a cross-section size of the cow 1 at the determined position p. In the embodiments disclosed, the parameter is related to the horizontal width of the cows 1, i.e. the width seen in a vertical direction. The horizontal width of the cows 1 is one of several possible cross-section sizes of the cow 1. Cows and other animals to which the invention is applicable normally have a cross-section size and a horizontal width that varies along the length of the cow 1. More specifically, the body part 2 has a significantly greater horizontal width than the head part 3. When the cows 1 are crowded in the passage 4 and thus are present very close to each other in a train of cows 1, as appears from Figs. 1 and 2, in such a way that the head part 3 of a first cow 1 lies partly above the body part 2 of a second forward cow 1 there will be a gap or a distance between the body part 2 of the

first cow 1 and the body part 2 of the second cow 1. Since the head part 3 of the first cow 1 has a smaller width than the body part 2 of the second forward cow 1, the cross-section size of the train of cows 1 will be smaller at this gap between the first cow 1 and the second cow 2. The sensor device 7, 8 is thus arranged to sense the cross-section size and to produce a signal when the parameter fulfils a certain condition, i. e. when the cross-section size of the cow 1 is less than a predetermined value at the determined position p. In the embodiments disclosed, the sensor device 7, 8 is arranged to produce a signal when the horizontal width of the cow 1 is less than a predetermined value at the determined position p. The sensor device 7, 8 is thus arranged to sense the cows 1 in a determined direction which is a substantially vertically, downward direction.

The sensor device 7, 8 comprises a first sensor 7 and a second sensor 8. The first sensor 7 is arranged to sense the presence of a cow 1 at a first point of the passage 4 whereas the second sensor 8 is arranged to sense the presence of said cow 1 at a second point of the passage 4. The first point and the second point are both located at the determined position p with regard to the transport direction t. The first point and the second point are thus located along the transverse line p but space the part from each other with a distance d. The distance d between the first point and the second point is selected in such a way that the distance d is larger than the horizontal width of the head part 3 of a cow 1 of a normal size, but smaller than the horizontal width of the body part 2 of a cow 1 of a normal size. In the embodiments disclosed, the first sensor 7 and the second sensor 8 are both located vertically above the first point and the second point, respectively, in the passage 4. As appears from Figs. 1 and 2, the first sensor 7 and the first point is located

in the proximity of the first enclosure member 5 seen in a vertical direction. The second sensor 8 and the second point is located in the proximity of the second enclosure member 6 seen in a vertical direction. The first sensor 7 and the second sensor 8 are thus provided above the animal passage 4 and the cows 1 in order to be able to sense cows 1 passing below the respective sensors 7 and 8.

The sensors 7, 8 may be of any suitable kind, for instance optical sensors, such as photo cells or video cameras, or any other proximity sensors, such as IR-sensors. It is to be noted that the invention is not limited to any kind of sensor but that any suitable sensor which is and will be available may be used.

The apparatus also comprises a control member 10 schematically disclosed in Figs. 1 and 2. The control member 10 is connected to the sensor device, i. e. to the first sensor 7 and the second sensor 8, and arranged to receive the signals produced by the sensors 7 and 8. The apparatus may also include an identification device 11 arranged in the proximity of the animal passage 4 for identifying the individual cows 1 passing through the animal passage 4. The identification device 11 may be of any conventional kind, for instance of a kind identifying the cows 1 by means of a transponder (not disclosed) carried by the cows 1. The identification device 11 is also connected to the control member 10 and arranged to produce an identification signal to be received by the control member 10. The control member 10 may comprise a processor 12, schematically disclosed, for processing the signals from the sensors 7 and 8 and the identification signal from the identification device 12 and for producing output signals to be delivered to further equipment to be described below. For instance, the control member 10 and the processor 12 may be arranged to count the cows 1

passing through the animal passage 4 in response to the signals produced by the sensors 7 and 8. The counted number of cows 1 may be delivered to a main control and supervising system provided in for instance a milking barn housing a large number of cows 1 and including an animal passage 4 extending between different areas of the barn.

The apparatus may also comprise one or several gate devices provided in or in the proximity of the animal passage 4 and arranged to take one of an open position and a closed position. The gate device in Fig. 1 includes a so-called interruption gate 14, 15 arranged to close the passage to prevent cows 1 from moving forward in the animal passage 4. The interruption gate 14, 15 includes, in the embodiment disclosed, two gate doors 14, 15, which are displaceable between said open position and said closed position by means of a respective associated activator 16, 17. The interruption gate 14, 15 is connected to the control member 10. The control member 10 and the processor 12 is arranged to control the position of the interruption gate 14, 15 to one of said open and closed positions. It is to be noted that the interruption gate 14, 15 also may be formed by one gate only and one actuator associated with the gate.

Fig. 2 discloses a second embodiment in which the gate device includes a direction gate 18 displaceable by means of an associated activator 19. The gate 18 is arranged to take a closed position or an open position. In the closed position, the animal passage 4 is closed and an exit passage 20 leading away from the animal passage 4 is open. In the open position, the animal passage 4 is open for passage by the cows 1 whereas the exit passage 20 is closed.

The present invention is not limited to the embodiments disclosed herein but may be varied and modified within the scope of the following claims.

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Claims

1. An apparatus for detecting an animal (1) having a body part (2) and a head part (3), comprising:

an animal passage (4) extending in a transport direction (t), said passage being defined by a first enclosure member (5) and a second enclosure member (6), which members are arranged on a respective side of the passage (4) and extend substantially in parallel to said transport direction (t), and

a sensor device (7, 8), which is arranged to sense the animal (1) in the passage (4),

characterised in that the sensor device (7, 8) is arranged to sense a parameter related to a cross-section size of the animal (1) at a determined position (p) in the passage (4), and to produce a signal when the parameter fulfils a certain condition.

2. An apparatus according to claim 1, characterised in that the sensor device (7, 8) is arranged to produce said signal when the value of said parameter indicates that the cross-section size of the animal (1) is less than a predetermined value at the determined position (p).

3. An apparatus according to any one of claims 1 and 2, characterised in that the parameter is related to the width of the animal (1) seen in a determined direction, wherein the sensor device (7, 8) is arranged to produce said signal when said parameter indicates that the width of the animal (1) is less than a predetermined value at the determined position (p).

4. An apparatus according to claim 3, characterised in that the determined direction is a substantially vertical direction.

5. An apparatus according to any one of claims 3 and 4, characterised in that the determined direction is a substantially vertically downward direction.

6. An apparatus according to any one of the preceding claims, characterised in that the sensor device (7, 8) comprises at least a first sensor (7) and a second sensor (8), wherein the first sensor (7) is arranged to sense the presence of the animal (1) at a first point of the passage (4) and wherein the second sensor (8) is arranged to sense the presence of the animal (1) at a second point of the passage (4).

7. An apparatus according to claim 6, characterised in that the first point and the second point are both located at the determined position (p) with regard to the transport direction (t) but spaced apart from each other with a distance (d), wherein said distance (d) is larger than the width of the head part (3) but smaller than the width of the body part (2) of an animal (1) of a normal size to be guided through the animal passage (4).

8. An apparatus according to any one of claims 6 and 7, characterised in that the first point is located in the proximity of the first enclosure member (5) whereas the second point is located in the proximity of the second enclosure member (6).

9. An apparatus according to any one of claims 6 to 8, characterised in that the first sensor (7) and the second sensor (8) both are provided above the passage (4) to sense the animal (1) passing below the respective first and second sensors (7, 8).

10. An apparatus according to any one of the preceding claims, characterised in that the apparatus comprises a control member (10) connected to the sensor device (7, 8).

11. An apparatus according to claim 10, characterised in that the control member (10) is arranged to count the animals (1) passing the animal passage (4) in response to the sensing of the sensor device (7, 8).

12. An apparatus according to any one of the preceding claims, characterised in that the apparatus comprises a gate device (14, 15; 18) arranged in the passage (4) to take one of an open position and a closed position.

13. An apparatus according to claims 10 and 12, characterised in that the control member (10) is arranged to control the position of the gate device (14, 15; 18) in response to the sensing of the sensor device (7, 8).

14. An apparatus according to any one of claims 12 and 13, characterised in that the gate device includes a gate (14, 15), which is provided in the proximity of the sensor device (7, 8) and arranged to close the passage (4).

15. An apparatus according to any one of claims 12 to 14, characterised in that the gate device includes a gate (18), which is provided in the proximity of the sensor device (7, 8) and arranged to close the passage (4) and open an exit passage (20) leading away from the passage (4).

Abstract

The invention refers to an apparatus for detecting an animal (1) having a body part (2) and a head part (3). The apparatus comprises an animal passage (4) extending in a transport direction (t), and a sensor device (7, 8) arranged to sense the animal in the passage. The passage is defined by a first enclosure member (5) and a second enclosure member (6). The enclosure members are arranged on a respective side of the passage and extend substantially in parallel to said transport direction. The sensor device is arranged to sense a parameter related to a cross-section size of the animal at a determined position in the passage, and to produce a signal when the parameter fulfils a certain condition.

(Fig 1)

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Fig 1

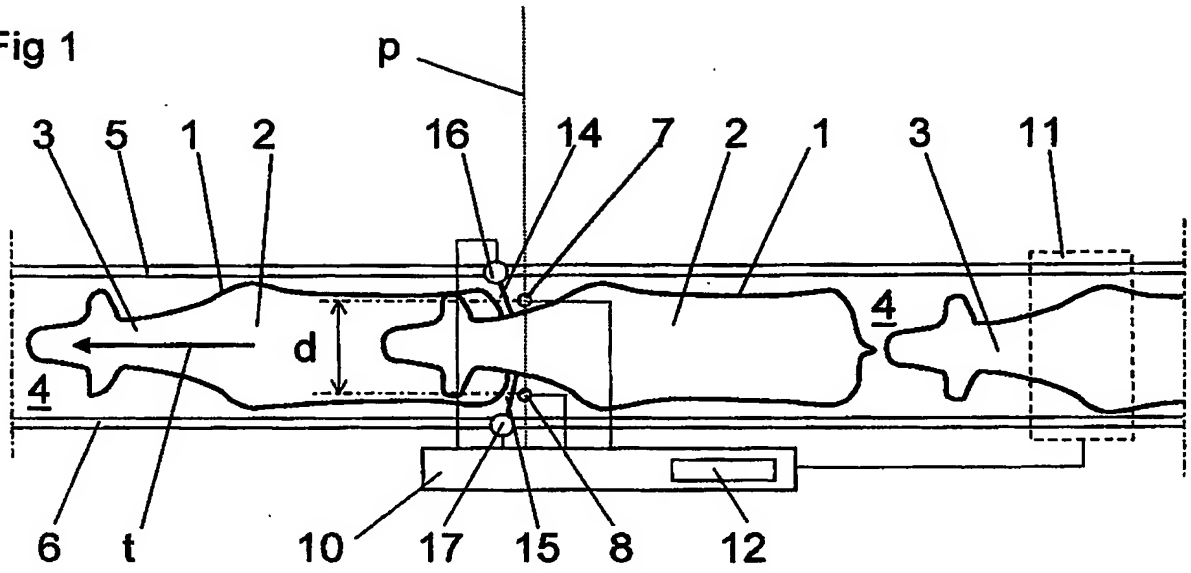
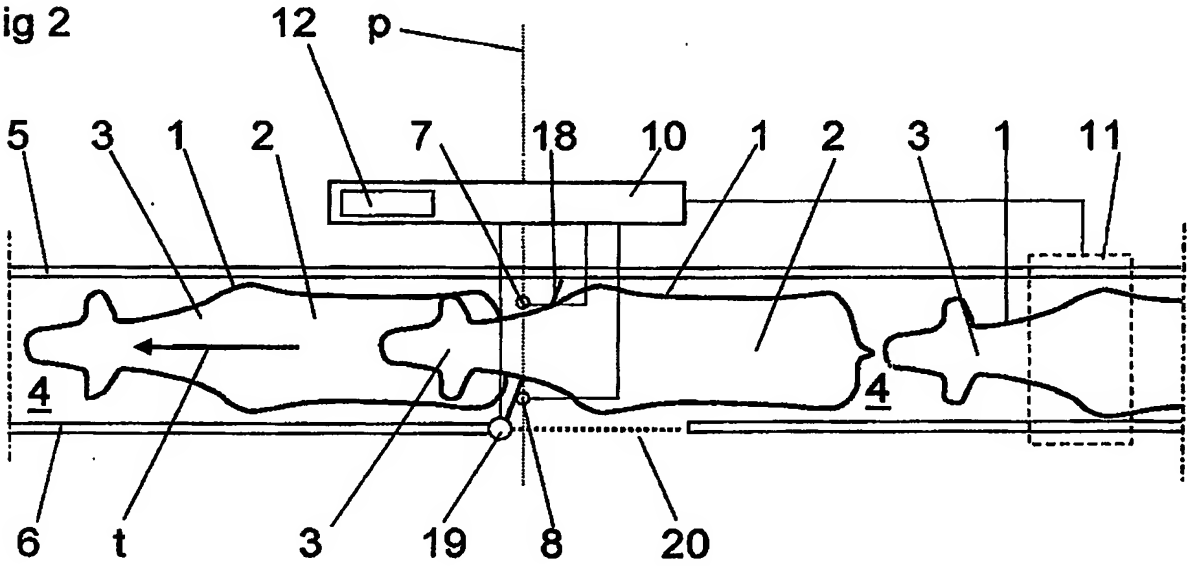


Fig 2



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